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GROUNDWATER POLLUTION DUE TO OVERUSE OF NITROGENOUS FERTILIZERS IN MOTALA AREA, MAHARASHTRA, INDIA

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ABSTRACT:- Agriculture is the backbone of the Indian economy and fertilizer play a key role in agricultural prosperity. Thus this study becomes very vital for the growth of the Indian economy, which is based upon Indian agriculture. Nitrogen fertilizers have been applied to yards, fields, golf courses to promote the growth of plants. Rainwater can wash nitrates in the fertilizer into streams and rivers or the nitrates can seep into ground water. This can also occur with animal waste and manure. In addition to animal waste, untreated human sewage can contribute to nitrate levels in surface and ground water. In addition, industrial plants and agricultural processing operations are potential sources of nitrate pollution. Nitrate is a common contaminant found in many wells in Motala region. Excess nitrate in drinking water can cause serious health problems for young infants. BIS has recommended standard for drinking water the maximum desirable limit of Nitrate concentration in 10.16 mg/l as nitrate N (45 mg/l as Nitrate NO3).Nitrite is one of the contaminants responsible for this degradation and is one of the most wide spread ground water contaminants. In Motala area it is observed that farmers uses high quantity of nitrogenous fertilizers for higher yield crop.

Keywords: - Nitrogenous Fertilizers, Nitrate, Groundwater, Fertilizer consumption, etc.

I. INTRODUCTION:

Groundwater is particularly important as it accounts for 88% of the drinking water in rural areas. Over the past few decades, the ever growing population, urbanization, industrialization and unskilled utilization of water resources have led to degradation of water quality. In the agriculture sector, large quantities of chemical fertilizers, pesticides and insecticides used to enhance the crop yield, on leaching enter the aquifer thereby polluting the groundwater. In many areas, overuse of irrigation water and chemical fertilizers besides monoculture type of cropping pattern have started which depleting and deteriorating water as well as soil quality. These factors in combination have lead to degradation of overall soil and groundwater environment. Therefore, it is essential to evaluate groundwater quality with reference to irrigation purposes. This will be useful in educating farmers and creating awareness among the local people about the groundwater pollution. This will also help in preventing the further degradation of soil and groundwater resources of the area. Nitrate can reach both surface water and groundwater as a consequence of agricultural activity (including excess application of inorganic nitrogenous fertilizers and manures), from waste water treatment and from oxidation of nitrogenous waste products in human and animal excreta, including septic tanks. As the population increased rapidly and since the possibilities of increasing the net sown area were nearly exhausted the incremental output from agriculture had to come from a higher yield per unit area. Hence the green revolution saw an increase consumption of chemical fertilizers namely nitrogenous (N), phosphorus (P) and potash (K). One of the reasons for problems of soil salinity and alkalinity in agricultural regions of India is the indiscriminant and faulty use of fertilizers. There is a recommended level of fertilizer for each crop and soil, which is known as the optimum level. Fertilizer use above or below this level creates imbalance which in turn causes environmental problems. In this paper an empirical analysis has been carried out to see the imbalance in nitrogenous fertilizer use.

II. METHODOLOGY:

2.1Resources & place of work:

Motala region of Buldana District is located in the northern part of Maharashtra State. Physiographic

ally the study area is divided into plane area and Nalganga valley. The plane area consists of hard & massive basaltic rocks and Nalganga valley is a rift valley having in situ salinity. Ground water quality in the study area needs to pay attention as the people are dependent on it for drinking and irrigation purposes. It is also noted that people from this area are suffering from renal disorders. Therefore physico-chemical parameters of 15 samples from wells were randomly collected and analyzed using different statistical techniques.

Geographically Buldana District lies between 19^0 51´North to 21^0 17´ North latitude and 75^0 57´ to 76^0 59´ East longitudes as shown in Figure 1.Total geographical area of the district is 9661 sq. km.The topography is undulated terrain with intermingling of hills and valleys and bare rocky outcrops facilitating rapid erosion. The northern part of the district forms the plain area and southern part is covered by Deccan trap. Major part of the study area covered by hard and massive basaltic rocks. Purna, Nalganga and Penganga are the major rivers flowing through the District. Buldhana is the western most district of Vidharbha. It is surrounded by Madhya Pradesh State in the north, on the east by Akola district, on the south by Parbhani district, in the west by Aurangabad and Jalgaon district.

Figure-1

2.2 Sampling:

There are 15 water samples are collected from different wells from Dabhadi, Talni and Datala villages in Motala region. In this region farmers are using nitrogenous fertilizers for their crops for higher yield cultivation. The samples are taken during pre-monsoon and post-monsoon period because during this period the uses of nitrogenous fertilizers are more.

2.3 Analysis:

Large amounts of fertilizers or farm waste drain into a river the concentration of nitrate and phosphate in the water increases considerably. In this paper we have going to analyze the nitrate contaminant present in ground water. Following are 15 samples are collected from different wells from different survey numbers.

Sample No.	Depth of Water Sample from G.L.(feet) Post Monsoon	Depth of Water Sample from G.L.(feet) Pre Monsoon
1	65	71
2	58	66
3	64	69
4	64	68
5	56	61
6	63	66
7	52	59
8	61	67
9	67	84
10	59	68
11	54	62
12	49	59
13	51	58
14	52	61
15	54	66

Table-1

Table 1 shows the depth of water samples collected after and before monsoon. The major source of variation in the water quality is the seasonal changes in the environment. The small change due to seasonal variations could be able to predict the trends in the constituent's concentrations over a longer time period .However; in the present study such temporal variations in the properties of ground water have been evaluated. [1] Thus, the samples were analyzed by covering two seasons have been used to assess the temporal variations in the concentration of the dissolved constituents in ground water. The average value of two seasons, i.e. post – monsoon (December 2013) and pre - monsoon (June 2014) for different parameters have been considered.

The following are the results are observed in nitrite in pre-monsoon and post-monsoon

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Sample No.	Nitrate (mg/lit) Desirable Limit	Post-Monsoon	Pre-Monsoon	Conclusion
1	0.0 to 45.0	52.20	48.25	All the results are seen more than desirable limit
2	0.0 to 45.0	68.30	61.59	
3	0.0 to 45.0	59.10	58.47	
4	0.0 to 45.0	76.90	64.29	
5	0.0 to 45.0	72.60	60.94	
6	0.0 to 45.0	71.80	64.34	
7	0.0 to 45.0	78.20	67.28	
8	0.0 to 45.0	56.82	49.20	
9	0.0 to 45.0	62.15	55.24	
10	0.0 to 45.0	69.25	62.39	
11	0.0 to 45.0	51.23	46.28	
12	0.0 to 45.0	48.29	44.36	
13	0.0 to 45.0	58.74	49.76	
14	0.0 to 45.0	56.24	48.48	
15	0.0 to 45.0	53.16	46.21	

Table-2

Table 2: Summery of physico-chemical characteristics of groundwater mainly Nitrite by BIS (Bureau of Indian Standards) from Motala area District Buldana, Maharashtra, India.

Post monsoon (Winter - December 2013) and Pre - monsoon (Summer - June 2014).

III. RESULT AND DISCUSSION:

Nitrite is one of the contaminants responsible for this degradation and is one of the most widespread ground water contaminants. While nitrate is just one of the potential ground water contaminants. Farmers put fertilizers and pesticides on their crops so that they grow better. But these fertilizers and pesticides can be washed through the soil by rain, to end up in rivers. From table-2 we observed that the nitrites present in water samples are more than the desirable limit in post-monsoon period which is more than 50 mg/l recommended by BIS. Also we observed that in Pree-monsoon period the nitrite level in water sample is less as compared to post-monsoon period.

Figure-2

Effects of Soil Pollution:

Reduced soil fertility
Reduced nitrogen fixation
Increased erodibility
Larger loss of soil and nutrients
Deposition of silt in tanks and reservoirs
Reduced crop yield
Imbalance in soil fauna and flora.

Nitrate contaminated groundwater can be difficult to remove nitrite from water for drinking purposes and for agricultural use. For this reason, prevention is the best way to ensure clean water. So for cleaning water following are the process to use for removal of these harmful nitrate ions like distillation, reverse osmosis, ion exchange or blending.

IV. CONCLUSION:

The over use of NPK fertilizers reduce quantity of vegetables and crops grown on soil over the years. It also reduces the protein content of wheat, maize, grams, etc., grown on that soil. Nitrate ion assessment studies around the Motala region indicate that the concentration of nitrate is higher than permissible limit (50 mg/l) in all groundwater samples collected from wells. The sources of nitrate pollution in the study area are agricultural activities and human and animal wastes. Fertilizer was found as the main source of nitrate pollution in Dabhadi, Talni and Datala Villages. Fertilizer is potential sources of nitrate pollution. Although chemical fertilizers are needed to increase food production, serious water pollution is occurring in countries with a high level of fertilizer use, as the result of excess applications of fertilizers. Farmers are generally afraid of a yield reduction if they apply less fertilizer. In practice, excessive fertilizer use tends to result in yield losses, rather than the maximum yield.

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